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**METHOD FOR THE TREATMENT OF GOODS  
WITH CARBON DIOXIDE AND NITROGEN****BACKGROUND OF THE INVENTION****Field of the Invention**

This invention relates to a method for the treatment of goods with carbon dioxide and nitrogen. More particularly, the method of this invention involves removing all of the pesticides from fumigation and replacing them with carbon dioxide and nitrogen wherein the carbon dioxide and nitrogen are generated in the same place where the goods are to be stored. This may be during transportation of the goods in ships or in storage plants. Due to its low cost and to the fact that the gases are considered organic, an additional value is provided to cereals, grains and subproducts.

**Description of Prior Art**

Requirements to use lower quantities of pesticides on goods bound for human and animal consumption have been increasing in the past few years. However, such goods are not accepted due to deterioration by insects, mushrooms, parted grains, etc.

In the storage of large quantities of cereals and subproducts, there are significant problems such as increasing of temperatures, fermentation, insects attacks, proliferation of mushrooms, etc. The temperature increase is due to the pressure and

humidity, thereby increasing the risk of fire. On the other hand, mushrooms have been major problems for goods over the past few years, due to the fact that the presence of mycotoxins can cause the goods to have to be discarded.

Presently, to fight against such problems, techniques such as movement of the goods, ventilation and fumigation with pesticides are being used. However, such techniques generate some inconveniences because the movement causes the parting of the grains, with a subsequent loss of quality and conventional fumigations, apart from having a high cost, are being eliminated due to new ecological concerns. In addition, in countries such as Germany and Holland it is difficult to carry out fumigation due to the fact that both silos and mills are located in urban areas. This is why the government doesn't allow the use of some of the fumigant gases such as phosphamine (aluminium phosphide), methyl bromide and others. Consequently, it is even more difficult to maintain the goods healthy and without insects.

### **SUMMARY OF THE INVENTION**

Carbon dioxide is a common gas in the atmosphere and, thus, it is not considered toxic. Using this gas, all of the problems discussed above are solved, because eliminating all of the oxygen from a room and replacing it with carbon dioxide or nitrogen results in elimination of all the insects and aerobic mushrooms. In addition, because there is no oxygen, the oxidation that occurs in the goods and

Up to the present, no one has found a way to generate carbon dioxide in place. The ways to carry out the fumigation with this gas used to involve carrying cylinders of 6 to 10 cubic metres of gas to the place where the goods were located. Generally, the quantities of the goods to be treated are high making it necessary to carry a lot of cylinders. Because these cylinders are very heavy (110 – 140 kilograms each), the task is difficult and costs are very high. This is why this type of treatment has not been used. In addition, it was not competitive with pesticides. As an example, in silos of 20000 tons, with a size of approximately 26000 cubic meters, the amount of gas required to remove the oxygen is at least 11700 cubic meters (minimum 45% of the total size). The quantity of cylinders to be used would be 1170, having a total weight of 163800 kilograms. Only the necessary labor for such a task has a higher cost than the fumigation with any pesticide.

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### **Example 3**

In the case of silo plants, there are no boilers or engines from which to obtain the gases. In this case, mobile carbon dioxide and nitrogen generators are used, which use the same air from inside the silo, consuming more than 98% of the oxygen. In this case, through a pipe located in the upper part of the silo, the air contained inside the silo is transmitted to the generator. Once the carbon dioxide and the nitrogen are generated, they are transmitted back to the silo through another pipe. This will start the air moving upwards, as a result of which after a certain amount of time, all the air contained inside the silo will go through the generator and all the carbon dioxide and nitrogen will be generated so as to saturate the atmosphere inside the silo. Once this point has been reached, the generator can be stopped, since, to maintain the combustion that generates the carbon dioxide and nitrogen, oxygen which is taken from inside the silo is needed.

With the examples above mentioned, we have shown the different ways to carry out the conditioning of the goods in accordance with the method of this invention in a way which is totally free of pesticides and fungicides, together with a cost highly competitive with conventional fumigation and treatment with fungicides. All this is looked for all around the world to reduce the quantity of chemical residues that remain in the goods which are bound to human consumption and which come from fumigation done in a conventional way.

TREATMENT  
METHOD FOR THE TREATMENT OF GOODS  
WITH CARBON DIOXIDE AND NITROGEN

BACKGROUND OF THE INVENTION  
Field of the Invention

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[The herein] invention, whose registration is applied for, in compliance with the different requirements from the Law, consists of a treatment of goods with carbon dioxide and nitrogen. More particularly, the at this invention involves from  
[Such] method [is characterised and distinguished for] removing all of the pesticides [in] fumigation, and with carbon dioxide where the  
replacing them [for carbonic gas] and nitrogen [due to the ability to generate] carbon dioxide and are generated  
nitrogen in the same place where the goods are to be stored. This [can] be [whether] during [its] transportation in ships or in [the] storage plants, due to its low cost and to the fact that they are  
considered organic [as] an additional value [it grants] for the cereals, grains and subproducts. Requirements to use lower Description of Prior Art for  
[Exigencies] about using less quantity of pesticides [for the] goods bound [to] human and animal consumption have been increasing in the [last] years. However, such goods are not accepted [to be] deteriorated by insects, mushrooms, parted grains, etc. due to  
In the storage of [big] quantities of cereals and subproducts, [we can find big inconvenience] such as: [increasing of temperatures, fermentation, insects attacks, proliferation of mushrooms, etc. there are significant problem  
The temperature increase is due to the pressure and [to] humidity, [increasing] [with it] the risk of fire. thereby  
On the other hand, [the] mushrooms [are the big enemies of the] goods [from] the [last] years, due to the have been major problems for past few  
fact that the presence of mycotoxins can cause [them] to be discarded. the goods to have over  
Presently, to fight against such problems, techniques [like] movement of the goods, ventilation and such as  
fumigation with pesticides are being used. However, such techniques generate some inconveniences because [the] movement causes the parting of the grains, with [the] subsequent [loss] of quality and [the] conventional fumigations, apart from having a high cost, are [attempting to be] eliminated due to [the] being

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ecological concerns

In addition, in new ecologist tendency. To this we must add that countries such as Germany and Holland have big difficulties to carry out fumigation due to the fact that both silos and mills are located in urban areas. This is why the government doesn't allow the use of some of the fumigant gases such as phosphamine (aluminium phosphide), methyl bromide and others. Consequently, with this it is even more difficult to maintain the goods healthy and without insects.

#### SUMMARY OF THE INVENTION

The carbon dioxide is a common gas from the atmosphere, therefore, it is not considered toxic. Using this gas, all of the difficulties above presented are solved, since eliminating from a room the totality of the oxygen and replacing it with carbon dioxide or nitrogen, all the insects and aerobic mushrooms are eliminated too. In addition, because results in elimination of oxidation that appears in the goods and generates an increase of the temperature or rancidness, is prevented. Such is the case of the oleaginous goods.

Up to the present, no one has found a way to generate the carbon dioxide in the place. Besides the ways to carry out the fumigation with this gas used to be carrying cylinders of 6 to 10 cubic metres of gas as far as the place where the goods were located. Generally, the quantities of goods to be treated are high [this was the reason why] it was necessary to carry a lot of tubes. Because cylinders are very heavy (110 - 140 kilograms each), the task is difficult turned to be troublesome and costs are very high. This is the reason why this type of treatment has not been used to be done, since in addition, it was not competitive with the pesticides. As an example we can bring forward that in the silos of 20000 tons, with a size of approximately 26000 cubic meters, the amount of gas to be applied to remove the oxygen is at least 11700 cubic meters (minimum 45% of the total size). The quantity of tubes to be used would be 1170, having a total weight of 163800 kilograms. Only the necessary labour to such a task has a higher cost than the fumigation with any pesticide. labor for



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[Nowadays, thanks to the investigations carried out <sup>we</sup> have <sup>discussed a method for</sup> found the way to generate carbon dioxide and nitrogen in the place where the goods are located at a <sup>really</sup> competitive cost. The <sup>method of this invention</sup> way to carry it out depends principally on the place where <sup>the goods</sup> they are located, hereby presenting different cases.]

#### DESCRIPTION OF PREFERRED EMBODIMENTS

<sup>method of this invention</sup> [1] To carry out the <sup>treatment</sup> inside the holds of the vessels, <sup>in accordance with one embodiment of this invention,</sup> we will make use of the gases that <sup>are emitted</sup> are given off from the steamer engines' exhaust chimneys. <sup>are used</sup> [A mixture of the different gases <sup>comprises</sup> among which we can find carbon dioxide, nitrogen, carbon monoxide and other gases coming from the engine combustion, <sup>gases</sup> are given off from the chimney]. The quantity of <sup>gas</sup> that these engines produce <sup>is substantially greater than</sup> widely overpasses what is necessary to fumigate all of the holds of the vessel. <sup>Therefore, it is desirable to separate out the desired gases.</sup> therefore what we will do is a depuration of the gases so as to get the ones that we really need. <sup>separate the</sup> To obtain carbon dioxide and nitrogen, <sup>are washed, filtered, cooled and catalysed</sup> we will make the following treatment to the gases coming from the exhaust: washing, filtering, cooling and catalysing. <sup>The separated carbon dioxide and nitrogen are then transmitted</sup> [With this, we manage to separate the gases that we are really interested in, to later send them to the holds <sup>to be fumigated</sup> we want to fumigate]. <sup>the amount of time required for the process can be readily determined</sup> With some easy calculations, we will know how long it must be working. <sup>Thereafter, it is</sup> [Therefore, after that time the device <sup>is</sup> will be disconnected and the goods <sup>are</sup> shall be completely protected.]

#### Example 2

<sup>Presently,</sup> [2] In the case of oil extraction plants, all of them have boilers. <sup>Up to the moment,</sup> all of the gases they <sup>produce</sup> give off <sup>emitted</sup> are freed to the atmosphere. Performing the same treatment above mentioned, we can obtain from those gases the carbon dioxide and the nitrogen we are interested in <sup>for carrying</sup> to carry out the treatment to the stored goods.

#### Example 3

[3] <sup>in</sup> For the case of silo plants, there are no boilers or engines <sup>from which</sup> where to obtain the gases <sup>in this case,</sup> above mentioned from. [Obtaining them can be done through the use of mobile carbon dioxide and

nitrogen generators, which use the same air from inside the silo [up to] consuming more than 98% of the oxygen. In this case [the generators work in the following way:] through a pipe located in the upper part of the silo, the air contained inside [this one is leaded up] to the generator [of the gas we are looking for]. Once the carbon dioxide and the nitrogen are generated, they are [leaded as far as] the silo through another pipe. [These ones] will start [moving] the air upwards, [with] which [in] a certain [moment] all the air contained inside the silo [will go through the generator and all the carbon dioxide and nitrogen will be generated as to saturate the atmosphere inside the silo. Once this point has been reached, the generator will stop working, since, to maintain the flame] that generates the carbon dioxide and nitrogen [burning] oxygen is needed [and it is taken from the air that is located inside the silo].

With the examples above mentioned, we <sup>have shown</sup> [hereby show] the different ways to carry out the conditioning of the goods <sup>in accordance with the method of this invention</sup> in a way which is totally free of pesticides and fungicides, together with a cost highly competitive with [the] conventional fumigation and [the] treatment with fungicides. All this is looked for all around the world to reduce the quantity of chemical residues that remain in the goods which are bound to human consumption and which come from [the] fumigation done in a conventional way.

It is because of the benefits that this treatment produce, that we want to register the utility model to use the carbon dioxide and the nitrogen in the goods that are bound to human and/or animal consumption in the aforementioned ways.

## SUMMARY

Method for the treatment of goods with carbon dioxide and nitrogen in the place where there are grains, cereals and subproducts stored. The way to do it, depends principally on the place where they are located, here in presenting different cases:

- 1) To carry out the treatment in the holds of the vessels, we shall get the carbon dioxide and nitrogen from the gases coming from the engine combustion and later given off through the chimneys. We shall perform to those gases the following treatment: washing, filtering, cooling and catalysing; with that, we shall select the gases to later send them to the holds we would like to treat.
- 2) In the case of oil extraction plants, all of them have boilers. Performing the same treatment above mentioned we will be able to obtain from those gases the carbon dioxide and the nitrogen to carry out the treatment of the stored goods.
- 3) For the case of the silo plants, their obtention can be carried out through the use of the mobile carbon dioxide and nitrogen generators. In this case the generators work in the following way: through a pipe located in the upper part of the silo, the air contained inside the silo is leaded as far as the generator of the gas we are searching. Once both the carbon dioxide and the nitrogen are generated, these ones are leaded until the silo through another pipe.

METHOD FOR THE TRATMENT OF GOODS  
WITH CARBON DIOXIDE AND NITROGEN.

The herein invention, whose registration is applied for, in compliance with the different requirements from the Law, consists of a treatment of goods with carbon dioxide and nitrogen. Such method is characterised and distinguished for removing all of the pesticides in fumigation, replacing them for carbonic gas and nitrogen, due to the ability to generate carbon dioxide and nitrogen in the same place where the goods are to be stored. This can be whether during its transportation in ships or in the storage plants, due to its low cost and to the fact that they are considered organic as an additional value it grants to the cereals, grains and subproducts.

Exigencies about using less quantity of pesticides for the goods bound to human and animal consumption have been increasing in the last years. However, such goods are not accepted to be deteriorated by insects, mushrooms, parted grains, etc.

In the storage of big quantities of cereals and subproducts, we can find big inconvenience such as: increasing of temperatures, fermentation, insects attacks, proliferation of mushrooms, etc. The temperature increase is due to the pressure and to humidity, increasing with it the risk of fire. On the other hand, the mushrooms are the big enemies of the goods from the last years, due to the fact that the presence of mycotoxins can cause them to be discarded.

Presently, to fight against such problems, techniques like movement of the goods, ventilation and fumigation with pesticides are being used. Such actions, generate some inconveniences, since the movement causes the parting of the grains, with the subsequent lose of quality and the conventional fumigations apart from having a high cost are attempting to be eliminated due to the

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Nowadays, thanks to the investigations carried out we have found the way to generate carbon dioxide and nitrogen in the place where the goods are located at a really competitive cost. The way to carry it out depends principally on the place where they are located, hereby presenting different cases.

- 1) To carry out the treatment inside the holds of the vessels, we will make use of the gases that are given off from the steamer engines' exhaust chimneys. A mixture of the different gases among which we can find: carbon dioxide, nitrogen, carbon monoxide and other gases coming from the engine combustion, are given off from the chimney. The quantity of gas that these engines produce, widely overpasses what is necessary to fumigate all of the holds of the vessel, therefore what we will do is a depuration of the gases so as to get the ones that we really need. To obtain carbon dioxide and nitrogen, we will make the following treatment to the gases coming from the exhaust: washing, filtering, cooling and catalysing. With this, we manage to separate the gases that we are really interested in, to later send them to the holds we want to fumigate. With some easy calculations, we will know how long it must be working. Therefore, after that time the device will be disconnected and the goods shall be completely protected.
- 2) In the case of oil extraction plants, all of them have boilers. Up to the moment all of the gases they give off are freed to the atmosphere. Performing the same treatment above mentioned, we can obtain from those gases the carbon dioxide and the nitrogen we are interested in to carry out the treatment to the stored goods.
- 3) For the case of silo plants, there are no boilers or engines where to obtain the gases above mentioned from. Obtaining them can be done through the use of mobile carbon dioxide and

nitrogen generators, which use the same air from inside the silo up to consuming more than 98% of the oxygen. In this case the generators work in the following way: through a pipe located in the upper part of the silo, the air contained inside this one is leaded up to the generator of the gas we are looking for. Once the carbon dioxide and the nitrogen are generated, they are leaded as far as the silo through another pipe. These ones will start moving the air upwards, with which in a certain moment all the air contained inside the silo, will go through the generator and all the carbon dioxide and nitrogen will be generated as to saturate the atmosphere inside the silo. Once this point has been reached, the generator will stop working, since to maintain the flame that generates the carbon dioxide and nitrogen burning, oxygen is needed and it is taken from the air that is located inside the silo.

With the examples above mentioned, we hereby show the different ways to carry out the conditioning of the goods in a way which is totally free of pesticides and fungicides, together with a cost highly competitive with the conventional fumigation and the treatment with fungicides. All this is looked for all around the world to reduce the quantity of chemical residues that remain in the goods which are bound to human consumption and which come from the fumigation done in a conventional way.

It is because of the benefits that this treatment produce, that we want to register the utility model to use the carbon dioxide and the nitrogen in the goods that are bound to human and/or animal consumption in the aforementioned ways.